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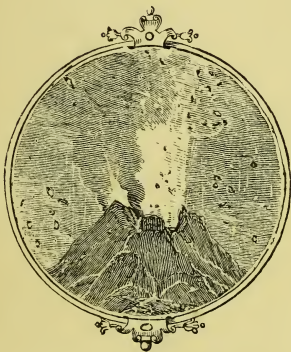
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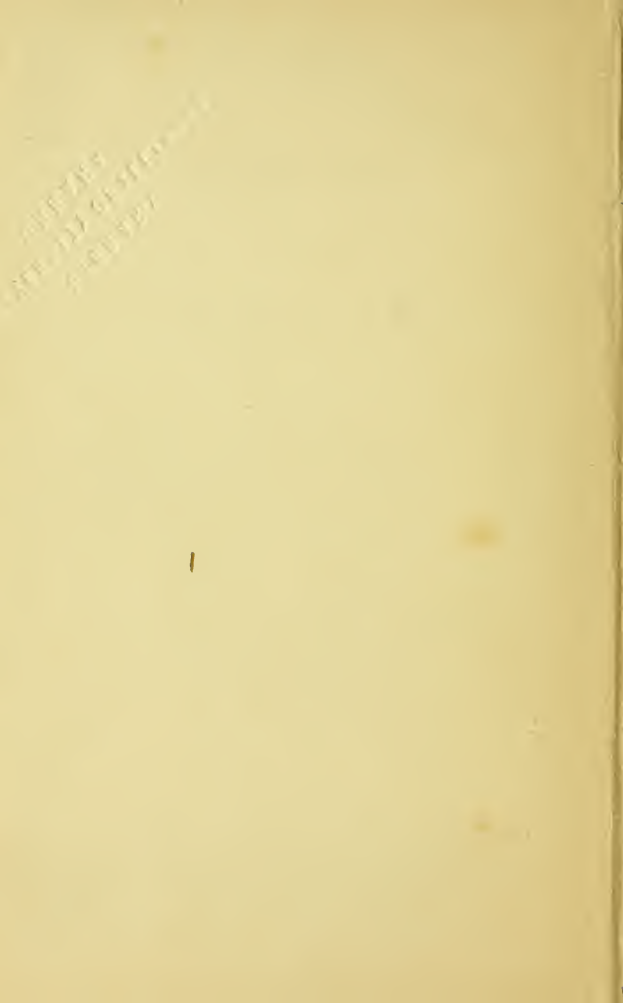


VIEW OF VESUVIUS AND VOLCANIC MOUNTAIN DISTRICT,  
NEAR NAPLES. \*

VOLCANOES  
AND  
CAVERNS.



G. NELSON AND SONS, LONDON & EDINBURGH





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## Preface.

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VOLCANOES and Caverns are generally reckoned amongst the greatest of the wonders of Nature. The more ignorant people are, the greater is the awe with which they view them. The very names of some of what are called the "wonders of nature" in Britain, show that in the olden times, people thought that the Evil One could play all sorts of pranks with the fair works of Creation; that he could have holes, and cellars, and caves, and chimneys just where he pleased, and with regard to our subject, volcanoes were his chimneys, and caverns his lurking-places !

Thanks to the spread of knowledge, even children now know that all Nature's works are *wonders*, and that in reality, there is no more *wonder* in the blazing of a volcano, than in the growth of a blade of grass. The volcano is as

much part of the great Creator's work, as is the gently purling brook ; it is necessary to render the earth habitable, or it would not exist. Nothing was created in vain, or as an object of mere wonder. Such "wonders" of Nature as volcanoes and caverns excite our curiosity because they are not seen by us as often as we see other works of Nature, which are no less wonderful because often seen.

A congreve, or lucifer match may produce more destruction than the greatest volcano ; the little brimstone tip of it might work more harm than the most powerful crater could effect. A little child could ignite a match, all the armies in the world could not cause an eruption of a volcano.





## VOLCANOES AND CAVERNS.

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### I.—VOLCANOES.



ULCAN was the Roman god of subterraneous fire, and from him—an imaginary being—"burning mountains" are called "volcanoes."

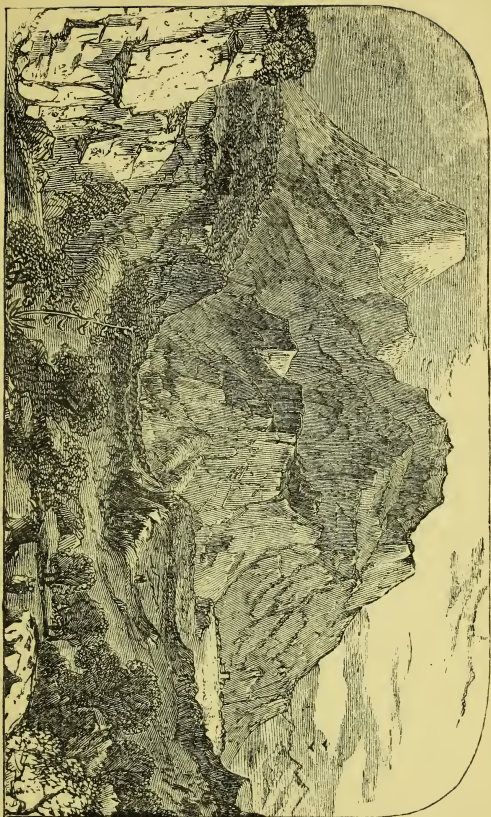
There are more than three hundred volcanoes; of which more than a hundred are in America, more than a hundred and fifty are in Asia and Oceania; there are twenty-one in Europe, and eleven in Africa. There may be many more in parts of the earth of which we know nothing.

The greatest rivers, and the loftiest mountains in the world, are in America,

and there also are the highest and mightiest volcanoes. In your Geography-book you will find that the highest ground in America is the summit of Aconcagua, an extinct volcano, nearly 24,000 feet high. It is one of the mountains of the great Andean chain, in which there are many other extinct volcanoes.

The loftiest of the volcanoes in the Andes which have in modern times been active, is Cotopaxi, which is nearly 19,000 feet high. It is the loftiest burning mountain in the world. If it were possible to place Mount Vesuvius on the top of Mount Etna, the summit of Vesuvius would still be more than 4000 feet below that of Cotopaxi!

Cotopaxi is in the midst of the Andes, and forty-one miles from Quito the capital of Ecuador. It is not only the loftiest and most powerful volcano in the world, but it is also the most beautiful of all the lofty mountains of the Andes. It is a perfect



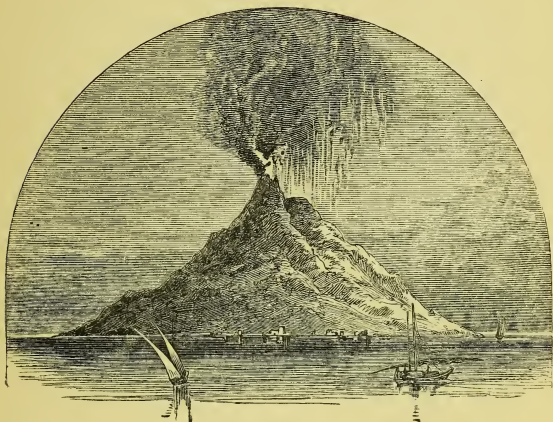
VIEW OF THE ANDES.

cone, and it is covered nearly to the edge of the crater with snow, which, at sunset, shines with dazzling splendour. No one has ever reached the brink of the crater, and it is supposed that it is impossible for any one to do so.

Its power is so great that it has thrown out to a distance of nine miles, a block of stone measuring one hundred and nine cubic yards! In the year 1738, its flames rose nearly 3000 feet above the crater; in 1744 its roaring was heard at a distance of nearly seven hundred miles. In the year 1803 its noise was heard, day and night, like the firing of great guns, at a distance of one hundred and eighty miles.

STROMBOLI is the most northern as well as the most eastern of the Lipari Islands. For more than two thousand years it has been blazing, and has been, what it will probably be for ages to come, the Lighthouse of the Mediterranean. It is nearly 3000 feet high.

Dolomien, a celebrated French scholar, who wrote a book called "Voyage to the Isles of Lipari in 1781," says, "The in-



STROMBOLI.

flamed crater is on the north-western part of the isle on the side of the mountain. I saw it dart during the night, at regular intervals of seven or eight minutes, ignited stones which rose to the height of more than 100 feet, forming rays a little diver-



gent, but of which the greater quantity fell back into the crater, while others rolled even to the sea."

He describes the crater as very small, having the form of a funnel terminating in a point. He says, "During all the time I observed it, the eruptions succeeded with the same regularity as during the preceding night. The approach of the eruption is not announced by any noise or dull murmur in the interior of the mountain, and it is always with surprise that one sees the stones darted into the air. There are times when the eruption is more precipitate and violent, and stones describing more divergent rays are thrown into the sea at a considerable distance."

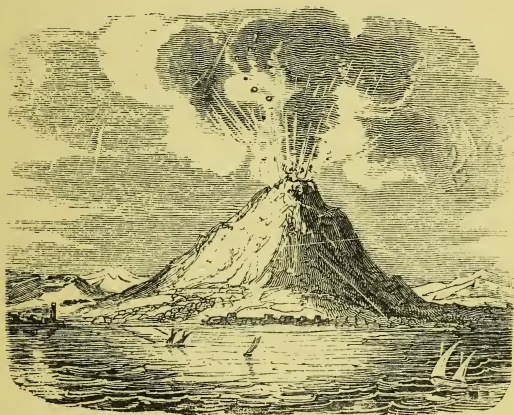
The eruptions are more violent during the winter seasons than during the summer.

MOUNT ETNA is in the Island of Sicily. The Sicilians call it Monte Gibello. It is the first volcano mentioned by ancient writers. It rises 10,000 feet above the



level of the sea, and it is about a hundred and eighty miles in circumference.

In the year 1669 an eruption of Etna destroyed fifteen towns and villages, and



MOUNT ETNA.

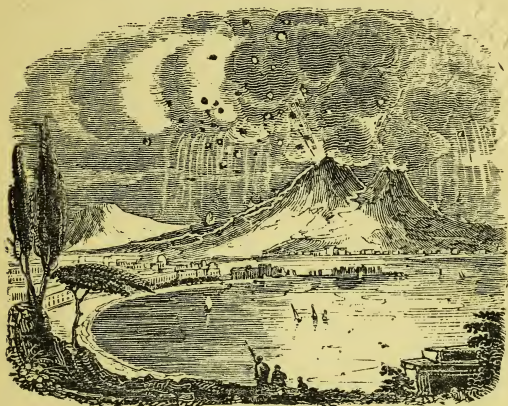
the stream of lava was so deep that it flowed over the city wall of Catania, which was sixty feet high.

MOUNT VESUVIUS is in Naples. It is nearly 4000 feet high. It is the only active volcano on the *continent* of Europe.

All the others are on islands. By an eruption of Vesuvius in the year 79, the cities of Herculaneum and Pompeii were destroyed. This eruption is the first on record, and from what a Roman poet wrote respecting it, we have every reason to believe that for ages the mountain was noted only for its fertility, and for the beauty of its surrounding scenery. There is no city in Europe so delightfully situated as Naples, which is also the largest city in Italy. Vesuvius is only eight miles distant from it.

It is very singular that History which records the *existence* of Herculaneum and Pompeii, which tells us of the great eruption of Vesuvius in the year 79, which says that by that eruption Pliny, "the Martyr of Nature," lost his life, is silent respecting the *destruction* of Herculaneum and Pompeii. An eminent geologist referring to this, says, "When, in 1738, the workmen in excavating a well, struck upon the theatre

of Herculaneum, which had been buried for seventeen centuries beneath the lava of Vesuvius; when subsequently (1750),

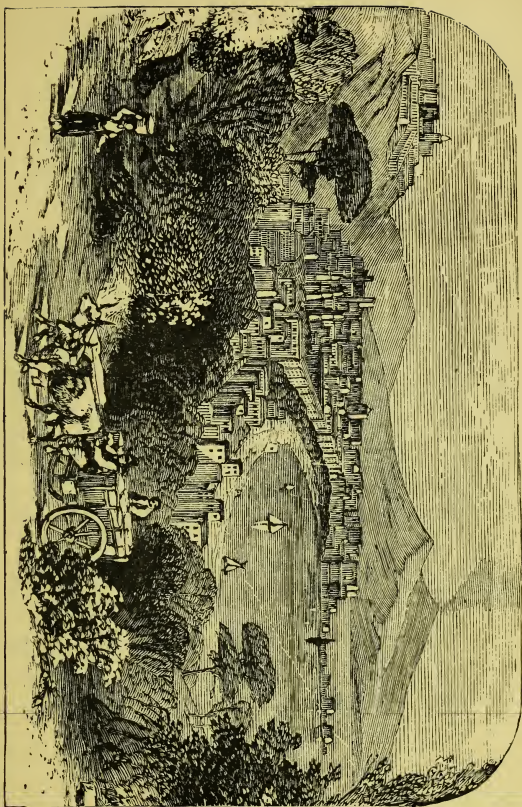


VESUVIUS.

Pompeii was disencumbered of its volcanic ashes, and thus two ancient cities were brought to light; had history been as silent respecting their existence as it was of their destruction, would not all observers say, and have not all actually said, "Here are the works of man, his houses, furniture,

and personal ornaments; his very wine and food; his dungeons, with skeletons of the prisoners chained in their awful solitudes, and here and there a victim overtaken by the fiery storm? Because the soil had formed, and grass, and trees had overgrown, and successive generations of men had erected their abodes over the entombed cities, and because these were covered with lava and cinders, does any one hesitate to admit that they were once real cities; that they stood upon what was then the surface of the country; that their streets once rang with the noise of business; their halls and theatres with the voice of pleasure; and that they were overwhelmed with the eruptions of Vesuvius, and their places blotted out from the earth, and forgotten? These inferences no one can dispute—all agree in the conclusions to be drawn. When, moreover, the traveller sees the cracks in the walls of Pompeii, and observes that some of them have been thrown out

BAY OF NAPLES.



of the perpendicular, and have been repaired and shoved up with props, he infers that the fatal convulsion was not the first, and that these cities must have been shaken to their foundation by the effects of previous earthquakes."

We may here remark that the first earthquake of which we have any record, was in the year A.D. 63. It occurred in the vicinity of Vesuvius, and its consequences were felt chiefly upon the cities upon the Bay of Naples, amongst which were Herculaneum and Pompeii.

Thucydides, who wrote more than 400 years B.C., makes a slight allusion to an earthquake which occurred at Eubœa the Greek Island, which is now called Negropont.

TENERIFFE is the largest of the Canary Islands. It is noted for a volcanic mountain called the PEAK, which is above 1200 feet high. Its highest crater, which is at its summit, has not sent forth flames for a very long time, but other craters on the





PEAK OF TENERIFFE.

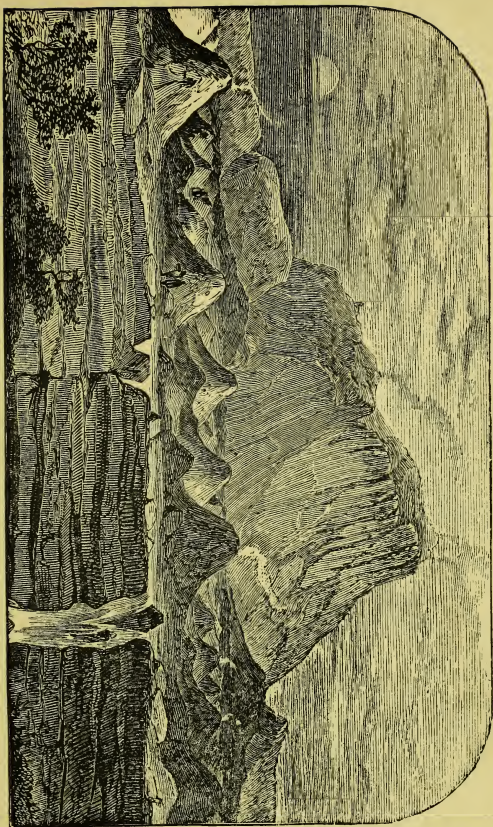
sides of it have been in a state of eruption in recent times.

The Peak of Teneriffe was active in the year 1798, but it had then had no eruption since 1706. The Peak of Teneriffe is sometimes called the Peak of Teyde ; it is a land-mark for ships in the North Atlantic Ocean.

There are thirteen islands in the group called the Canaries, and they are supposed to be what the ancients called the Fortunate Islands. The islands, of which the capital is Santa Cruz, in Teneriffe, belong to the Spaniards. They are all volcanic, and rise abruptly from the ocean. Teneriffe is about seventy miles long, and about twenty-two miles broad.

THE VOLCANO OF JORULLO is in Mexico. It is always burning. Its site, and the site of all the volcanoes which surround it, was part of the great *plain* of Malpais, until the night of September 28, 1759. Then more than three miles of level country was





JORULLO.

upheaved into the shape of a cone, and a number of mountains appeared, six of them with an elevation of from 1312 to 1640 feet above the original level of the plain.

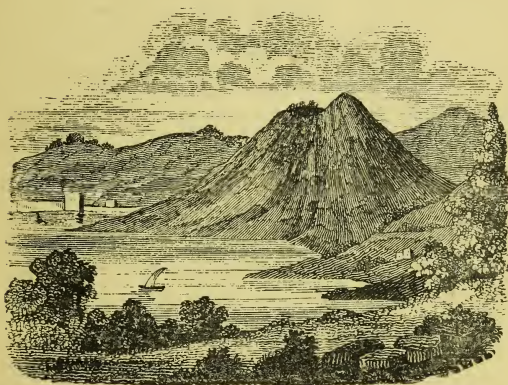
Around these mountains there are thousands of small cones which are called *hornitos*, or "ovens," because they look like ancient ovens, and they are as *hot* as ovens.

The great volcano of Jorullo is about 1300 feet high. It is farther from the sea than any other known volcano.

THE ISLAND OF VOLCANO is one of the Lipari Islands of which there are twelve, all of volcanic origin. They were formerly called the "Æolian Islands," from Æolus, the god of winds; he, like Vulcan, was the mythologic son of Jupiter.

Though the volcano in the Island of Volcano has not for ages emitted flames, it emits gaseous vapours which prove that the volcanic cause still exists in it. This volcano is commonly called an *extinct*

volcano, that is a volcano in which the fire has burnt out; but a learned traveller who examined it, says that it greatly resembles an active volcano during the cessation of eruption. He says that



EXTINCT VOLCANO.

he could not “ imagine a spectacle of more solemn grandeur than that presented in its interior, or conceive a spot better calculated to excite in a superstitious age that religious awe which caused the island to be considered

sacred to Vulcan, and the various caverns below as the peculiar residence of the gods."

Off the coast of Troas in Asia Minor, is the Isle of Lemmos, on which is an extinct volcano. It is a famous island in heathen mythology. Jupiter kicked his ugly deformed son Vulcan out of heaven into Lemmos, and as heathen gods as well as men had to do something for their living, Vulcan's occupation was to forge thunderbolts for his father !

Active volcanoes are usually divided into two classes, the one aërial, having their craters exposed to the air; the other sub-aqueous, having their craters under water. The *crater* ("cup"), is the mouth or chimney of the volcano, whence the lava or melted rock is ejected.

Aërial volcanoes are never far from the sea. A line drawn round the Pacific Ocean, so as to include the long range of mountains on the west of America, the Asiatic peninsula of Kamtschatka, and the Spice

Islands, will encompass the most extensive volcanic system known. As we have remarked, there is but one active volcano on the continent of Europe. There is not—so far as is yet known—one volcano on the continent of Africa, although nearly all its



VOLCANIC ISLAND.

groups of islands are either volcanic, or have volcanoes.

It is likely that many aërial volcanoes were once subaqueous; that the islands themselves were the result of volcanic action. In the present century, islands

have suddenly appeared, some have as suddenly disappeared. Most of them have had craters.

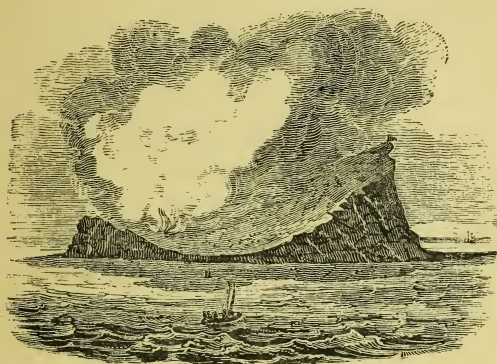
HOTHAM ISLAND was also called Graham Island, and Corrao Island. It was thrown up in the Mediterranean Sea, between the south-west coast of Sicily and the coast of Africa. This was in 1831. On the 10th of July in that year, a Sicilian captain named Corrao observed an immense column of water rising from the sea. It was about sixty feet high, and three hundred feet in circumference.

Eight days afterwards he passed the same spot again, and found that a small island twelve feet high had been formed. In the centre of it was a crater whence immense columns of vapour and masses of volcanic matter were ejected.

Gradually the island increased in height and size up to the 4th of August, on which day it was two hundred feet high, and three miles in circumference. But from that day



it began to decrease. By the end of October, the volcano and the island on which it was, entirely disappeared; one



HOOTHAM ISLAND, JULY 18, 1831.

small point above the surface of the water marked the site which was regarded with so much interest by scientific men three months before. In the next year, an extensive shoal occupied the site of Hotham Island, and in the year after that, a dangerous reef nearly a mile in circumference appeared.

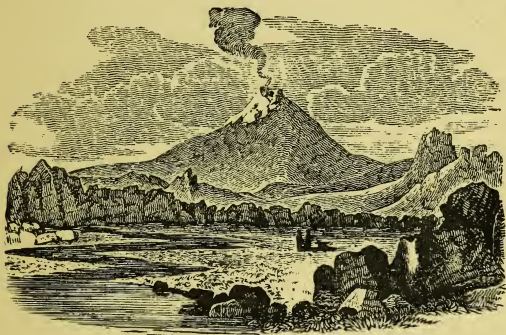
MOUNT HECLA is a volcano in Iceland. It is famous for its many eruptions. Its height is more than 5000 feet, and it is about twelve miles in circumference.

There were no explosions from Hecla for a period of between sixty and seventy years previous to September 2, 1845, when the eruptions were awfully grand. Volcanic ashes from its summit fell on the largest of the Orkney Islands, a distance of four hundred miles. On the 15th of September the volcano resumed its activity, and its lava was thrown out with such violence that it fell in places from twenty to thirty miles distant from the mountain. At a distance of two miles from Hecla, the stream of lava was a mile wide, and from forty to fifty feet deep. Wherever the lava flowed, the pasturage was destroyed, so that in addition to the heavy losses which the inhabitants sustained by large numbers of their cattle perishing by the burning lava, they had no means of pro-



curing fodder for the cattle that were saved.

Hecla, though the best known of the Icelandic volcanoes is not perhaps the most

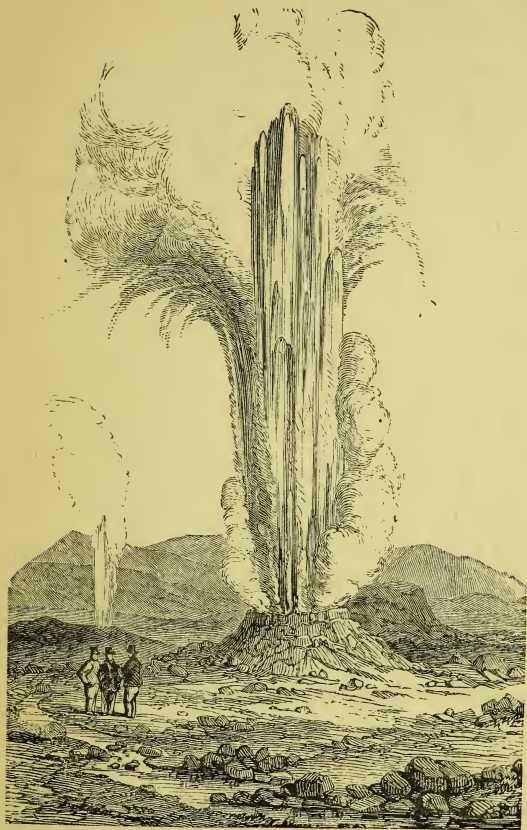


MOUNT HECLA.

formidable. There are five others which have had memorable eruptions, and it is not known how many volcanoes there are in Iceland. One of the most terrible eruptions ever known in the island, or indeed in Europe, was in the year 1783. This was from the mountain called the Skaptár Jokul. The lava flowed into the river Skapta and

dried it up, though in some places the bed was nearly six hundred feet deep, and two hundred feet broad. The lava not only occupied all the river-way, but it also spread over the fields on the banks of the river. Onwards the stream of lava flowed till it discharged itself into a great lake, the water of which it "licked up," or "sent off" in steam. The lava overflowed from the bed of the lake, and divided into two great streams, one of which "was precipitated down a tremendous cataract called Stapa-foss where it filled a profound abyss which that great waterfall had been hollowing out for ages, and after this the fiery current again continued its course." About nine thousand human lives were lost, and more than two hundred thousand sheep and cattle, and twenty-eight thousand horses perished.

The geysers or boiling springs of Iceland owe the heat of their waters to volcanic action. *Geyser* is an Icelandic word which means to burst forth with great and sudden force.

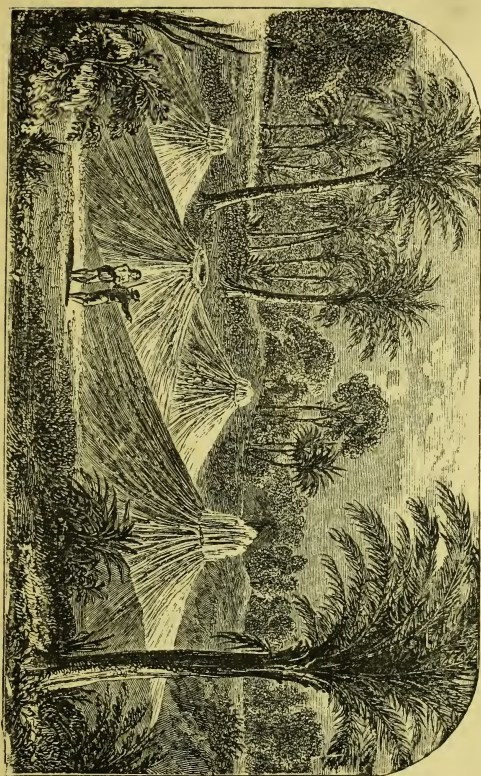


GEYSERS OF ICELAND.

Though the term "volcano" is generally applied to a mountain which ejects—or which formerly ejected—lava, or melted rocks; it is sometimes used to denote a mountain or elevation which ejects mud.

Such elevations are commonly called "air volcanoes." The most remarkable are those of Turbaco, an American Indian village in Columbia. The village is more than eleven hundred feet above the level of the sea. On a large desolate marshy tract of land, in the midst of palm trees, are a number of cones, varying in height from nineteen to twenty-five feet; they are air volcanoes.

The natives call them, *Los Volcancitos*, "the small volcanoes;" and they have a tradition that the ground was formerly in a state of ignition, in other words, that it was a fire-volcano, but that a monk put out the fire by throwing holy water on it, and that the fire-volcano became a water-volcano.



TUREBACO.

Mud volcanoes are filled with water through which air bubbles rise, and cause about five explosions in two minutes.

Beneath the water there is soft mud to a great depth. A stick has been pushed into it to the depth of six or seven feet.

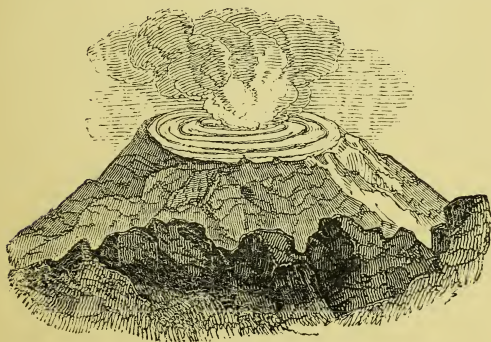
It is impossible to say how much the surface of the globe has been from time to time in far distant ages altered by volcanic agency. One celebrated man conjectures that the islands which stretch from Asia to Australia once formed part of a great continent. All those islands have volcanoes. One of the greatest volcanic eruptions of modern times occurred on the 5th of April 1815. It was from Mount Tomboro in the Island of Sumbawa. Its influence was felt "over the whole of the Molucca Islands, over Java, a considerable portion of the Celebes, Sumatra, and Borneo to a circumference of 1000 statute miles from its centre." Whole villages were totally destroyed. Two places are mentioned



as containing certainly not fewer than 1200 persons at the time of the eruption, and of that large number not more than six escaped!

There are basalt rocks in various parts of the world, and they are all of volcanic origin. Through some, water forces its way, and murmurs in streams or roars in cascades.

Basalt rocks belong to that class of rocks which geologists call Trappean, from a Swedish word *Trappa*, which signifies a stair or step. The material is much the same as that which forms *greenstones*, or

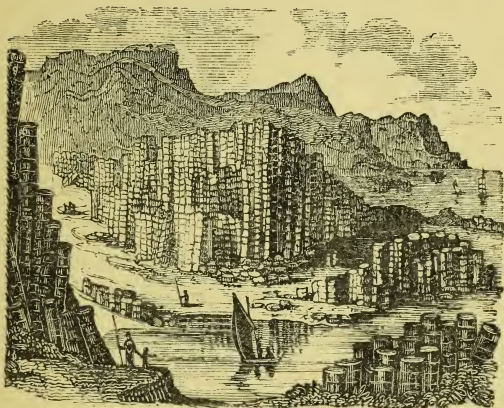


MUD VOLCANO.

what are commonly called *whinstones*, and which sometimes assume the column or prismatic form peculiar to basalt rocks. There are many varieties of basaltic rock, which we cannot describe in so small a work as this, but we must not omit to notice those of the form most attractive and interesting, that is, the columnar and angular form. They form as it were a link between volcanoes and caves, for they are of volcanic formation, and they present some of the most interesting caves. Basalt rocks are generally of great extent, and their appearance is that of a number of straight tall pillars placed closely together to form a solid mass, each pillar has a certain number of sides or angles. The number varies from three to eight. A mass of basalt rock presents more the appearance of a work of art, than of what is too commonly called a "convulsion of nature." It looks like the ruins of some magnificent building.



THE GIANT'S CAUSEWAY in county Antrim, Ireland, is a great natural curiosity. It is an immense mass of basalt rock, about 600 feet into the Atlantic



THE GIANT'S CAUSEWAY.

Ocean. Some of the masses of columns are 35 feet above the sea, though the greater number are not more than 20 feet above the water.

It is believed by some that the Giant's Causeway and Fingal's Cave of which we

speak presently, are evidences that the countries now called Scotland and Ireland were—long before history was written, or perhaps before the art of writing was invented—part of a great continent. In other words, that the country now called Ireland was separated by volcanic agency from that part of Great Britain which is now called Scotland. That Britain itself formed at one time part of the great continent of Europe is now almost generally believed. How it was separated can be only conjectured. The probability is that it was by volcanic agency which produces earthquakes and other great convulsions of nature.





## II.—CAVERNS.

**I**T is, by many learned men, believed that volcanic mountains are the huge domes of immense hollows or caverns, in which the gaseous or fiery vapours of the earth float. The whole plain of Jorullo is supposed to be the covering of an enormous cavern, or

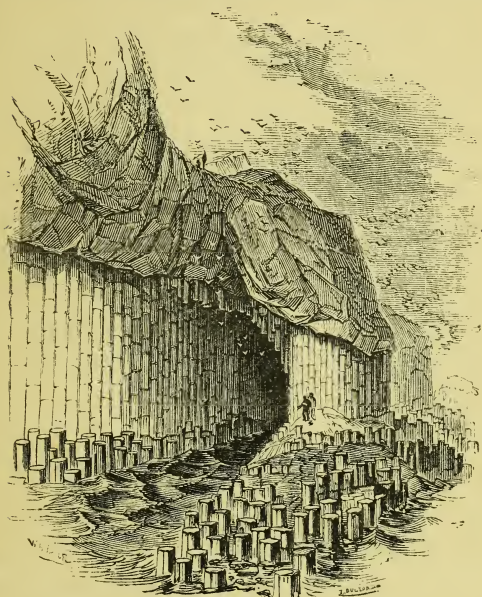
of an immense number of caverns which communicate with each other; and, indeed, the table-land of Quito, around which, as we have already stated, are the greatest and most powerful volcanoes, is supposed to be but the covering of a vast vault.

Caverns are found in all parts of the world; in some rivers take their rise, in others rivers are lost. In some the roar of water may be heard beneath the lowest floor, and it is probable that there are subaqueous as well as subterranean caverns.

One of the Hebrides or Western Islands—a group of small islands which lie off the west coast of Scotland, is called the Isle of Staffa. It is celebrated for its basalt caverns, the principal of which is called Fingal's Cave.

Staffa is a Norwegian word, which, like the Anglo-Saxon word *staef*, signifies a staff. The English town Stafford derives its name from the fact that in ancient

times, persons used to *ford* or go through the river Sow on stilts by the aid of staves, for there were no bridges in Britain. The



FINGAL'S CAVE.

Scottish Island Staffa was so named because the basalt columns of its caverns reminded

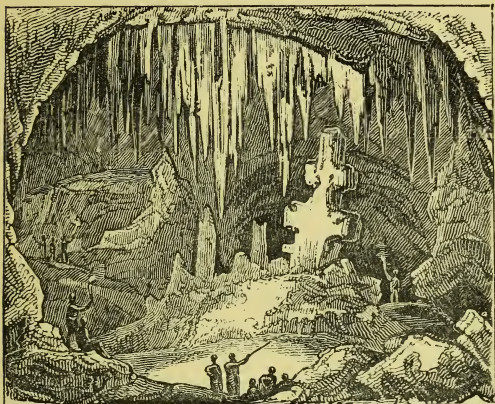
the Norwegians of immense staves or poles.

The action of the waves has worn away the basalt columns in various parts, and thus the caverns have been formed. One cave is called the Cormorant Cave, because of the large number of Cormorants which visit it. Another is called the Boat Cave. But none of the caves are equal in size and grandeur to Fingal's. It is more than 370 feet long, 53 feet wide at the mouth, at which the height is about 118 feet. The Gaelic name of the cavern signifies the Cave of Music. It is so called from the echo of the waves through its arches.

The Island of Antiparos is one of the group of Greek Islands, called the Cyclades. It has been long celebrated for its grotto, the ceiling, walls, and floors of which have beautiful stalactites and stalagmites in great variety.

*Stalactites* are "droppings." Many caverns are of limestone rock. From the

roofs water drips slowly, and in very small quantities. As it trickles from the surface of the earth to the roof of the cavern, it mixes



GROTTO OF ANTIPAROS.

with carbonate of lime, which is held in solution by carbonic acid. When the drops of water come through to the roofs of the caverns, the carbonic acid, being exposed to the air, evaporates; a little thin skin of lime is left on the roofs of the caverns. As



more water trickles through the thin skin or *pellicle* of lime, as another coat, or skin, or pellicle grows on it, then another, and another, and so on till hundreds, thousands, and in some cases millions of pellicles, one upon another, depend or hang down from the roofs like icicles.

Stalagmites are stalactites rising from the ground or floor of caverns. When the drops of water are large and heavy, they fall to the ground, the carbonic acid evaporates and leaves the carbonate of lime, and so pellicle upon pellicle is deposited, until, in the course of time, immense columns or pillars are raised.

In many cases the stalactites and the stalagmites meet and form pillars from the ground to the roof. Such pillars look as though they were built to support the roofs.

THE PEAK CAVERN in Derbyshire is similar in form to that of Antiparos, that is, it has a number of apartments as it were



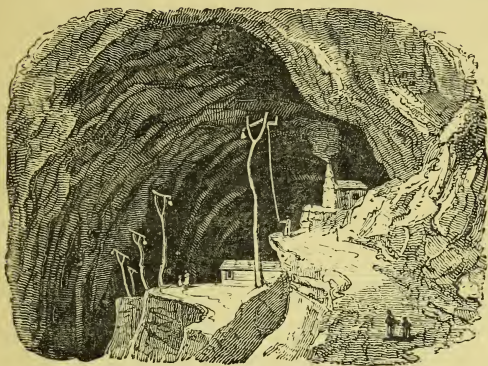
STALACTITE CAVERN.

resembling each other, and connected by passages. The cavern is in Castleton Dale.

It has an arched entrance 42 feet high, and 120 feet wide. There are houses, occupied by twine makers, in the cave near its entrance, but at a distance of about 100 feet, the roof of the cave becomes lower and lower, till at last daylight entirely disappears, and the visitor must proceed by torchlight and in a stooping position till he comes to a lake called the First Water. The rock overhangs the water, and in one place is less than two feet from its surface, so that the visitor must lie down in the boat in which he is ferried across the lake. When the lake is crossed, a large cave is reached. It is 220 feet long, 200 feet wide, and in some parts 120 feet high, but it is quite dark.

Beyond this great cavern, by the side of what is called the Second Water, is another cave formed by a projecting pile of rocks. It is called "Roger Rain's House," because water is always dripping from the roof. After that is another cavern called the

Chancel, and after that there are several others. The total length of the Peak



ENTRANCE TO THE PEAK CAVERN.

Cavern is more than 2200 feet, and it is more than 600 feet below the surface of the mountain.

We have but briefly noticed a few of many remarkable caverns which belong to one kind as regards *form* or shape. There are two other kinds. One in which the caverns are immense cracks, or fissures, or chasms in the rocks. They are seldom very

wide, but often very long and very deep. Eldon Hole in Derbyshire is the most remarkable cavern of this kind in Britain. Its length and depth have not been ascertained.

The other kind of caverns is called *transparent*, because the light of day can be seen through them; they are open at both ends.

Caverns are frequently mentioned in history—sacred as well as profane; they have in all ages been used as places of sepulture for the dead, and as places of security or secrecy for the living. In our own times when science is making such rapid strides, caverns are often museums to the naturalist; he finds in them the bones of interesting animals, and evidence that animals now found only in distant countries once inhabited places close to where there are now largely populated British towns.





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